

# Will forest conservation areas protect functionally important diversity of fungi and lichens over time?

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## Abstract

Incorporating functional values in biodiversity monitoring systems could add novel perspectives of the status of biodiversity in conservation areas. Stable frequencies of large foliose nitrogen-fixing cyanolichens likely have positive effects on the nitrogen budget of forests and provide food, material and shelter for invertebrates, gastropods and birds. Stable volumes of deadwood and frequencies of associated fungi provide an important supporting function for ecosystem services such as nutrient cycling, carbon storage and soil formation. Based on regional monitoring data from boreal old-growth forest nature reserves and key habitats, we tested for changes in the frequency of various functionally important substrates and species over time. We detected significant reductions in the frequency of indicator cyanolichens occurring on deciduous trees already after 10 years in key habitats, despite non-significant changes in their host substrates. Frequencies of indicator pendulous lichens *Alectoria sarmentosa* and *Bryoria nadvornikiana* had also decreased in key habitats, despite overall stable volumes of large conifer host trees. Lichen reductions were more pronounced in the smaller key habitats compared to the larger formally protected nature reserves, likely due to degrading fragmentation and isolation effects. In contrast to these lichens, the average frequencies of old-growth forest indicator fungi decaying coniferous deadwood and common fungi on deciduous trees (*Fomes fomentarius*) and coniferous trees (*Fomitopsis pinicola*) remained unchanged. The studied cyanolichens and fruiting fungi generally had similar extinction rates over 10 years, whilst only cyanolichens had substantially lower colonization rates. Amid a severely fragmented landscape, conservation areas seem to struggle in preserving some of the basic old-growth forest values.

## Keywords

Biomonitoring; Cryptogams; Ecosystem function; Functional groups; Indicator species; Protected areas